U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-278 347

A Research Strategy for Social Assessment of Lake Restoration Programs

Corvallis Environmental Research Lab, Oreg

Feb 78

EPA-600/5-78-004
February 1978

PB 278 347

Socioeconomic Environmental Studies Series

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

RESEARCH REPORTING SERIES

Research reports of the Office of Research and Development, U.S. Environmental Protection Agency, have been grouped into nine series. These nine broad categories were established to facilitate further development and application of environmental technology. Elimination of traditional grouping was consciously planned to foster technology transfer and a maximum interface in related fields. The nine series are:

1. Environmental Health Effects Research
2. Environmental Protection Technology
3. Ecological Research
4. Environmental Monitoring
5. Socioeconomic Environmental Studies
6. Scientific and Technical Assessment Reports (STAR)
7. Interagency Energy-Environment Research and Development
8. "Special" Reports
9. Miscellaneous Reports

This report has been assigned to the SOCIOECONOMIC ENVIRONMENTAL STUDIES series. This series includes research on environmental management, economic analysis, ecological impacts, comprehensive planning and forecasting, and analysis methodologies. Included are tools for determining varying impacts of alternative policies; analyses of environmental planning techniques at the regional, state, and local levels; and approaches to measuring environmental quality perceptions, as well as analysis of ecological and economic impacts of environmental protection measures. Such topics as urban form, industrial mix, growth policies, control, and organizational structure are discussed in terms of optimal environmental performance. These interdisciplinary studies and systems analyses are presented in forms varying from quantitative relational analyses to management and policy-oriented reports.

This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161.

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA-600/5-78-004	2.
3. RECIPIENT'S ACCESSION NO. PB278347	
4. TITLE AND SUBTITLE A Research Strategy For Social Assessment of Lake Restoration Programs	5. REPORT DATE February 1978
	6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) William D. Honey and Thomas C. Hogg Department of Anthropology Oregon State University	8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Same as box 12	10. PROGRAM ELEMENT NO. 1BA608
	11. CONTRACT/GRANT NO. CC6991885-A
12. SPONSORING AGENCY NAME AND ADDRESS Corvallis Environmental Research Laboratory Office of Research and Development U.S. Environmental Protection Agency Corvallis, Oregon 97330	13. TYPE OF REPORT AND PERIOD COVERED extramural
	14. SPONSORING AGENCY CODE EPA/600/02
15. SUPPLEMENTARY NOTES	

16. ABSTRACT This research was initiated in order to examine the social implications of lake restoration programs and to develop a standardized methodology for social impact assessment.

A cultural ecological model is employed since it provides perspectives on the relationship of human adaptation and cultural development in evolutionary terms. Use of the model calls for examination of both spatial and temporal parameters. The model has not been tested in a specific research environment, but it has been developed from strategies which have proved effective in examining the social implications of public works projects.

A general research strategy is set forth to encompass historical, geographical, and ethnological components in a cultural setting. Data are quantified for a contemporary social profile, and for projections with and without project implementation. All data are examined in terms of five instrumental cultural functions. Criteria for socio-cultural assessment are employed from a research matrix.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Social Impact Assessment Culture Ecology Ethnology Social Anthropology Human Ecology Technological Change		05/K

18. DISTRIBUTION STATEMENT Release to public	19. SECURITY CLASS *(This Report)* Unclassified 20. SECURITY CLASS *(This page)* Unclassified	21. NO. OF PAGES 53 22. PRICE PC A04-A01

EPA Form 2220-1 (9-73)

★ U.S. GOVERNMENT PRINTING OFFICE: 1978—799-838/78 REGION 10

EPA-600/5-78-004
February 1978

A RESEARCH STRATEGY FOR SOCIAL ASSESSMENT OF LAKE RESTORATION PROGRAMS

William D. Honey and Thomas C. Hogg
Department of Anthropology
Oregon State University
Corvallis, Oregon 97331

Purchase Order No. CC6991885-A

Project Officer

Bruce A. Tichenor
Criteria and Assessment Branch
Corvallis Environmental Research Laboratory
U.S. Environmental Protection Agency
Corvallis, Oregon 97330

CORVALLIS ENVIRONMENTAL RESEARCH LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
CORVALLIS, OREGON 97330

DISCLAIMER

This report has been reviewed by the Corvallis Environmental Research Laboratory, U.S. Environmental Protection Agency, and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the U. S. Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

FOREWORD

Effective regulatory and enforcement actions by the Environmental Protection Agency would be virtually impossible without sound scientific data on pollutants and their impact on environmental stability and human health. Responsibility for building this data base has been assigned to EPA's Office of Research and Development and its 15 major field installations, one of which is the Corvallis Environmental Research Laboratory (CERL).

The primary mission of the Corvallis Laboratory is research on the effects of environmental pollutants on terrestrial, freshwater, and marine ecosystems: the behavior, effects and control of pollutants in lake systems; and the development of predictive models on the movement of pollutants in the biosphere.

Section 314 of the Water Pollution Control Act Amendments of 1972 provides funds on a matching basis to States for the restoration of lakes to improve their utility to local communities. As part of this "Clean Lakes Program," CERL evaluates the restoration projects to determine the changes in the lake's quality, both limnologically and socio-economically. This report provides methodology for assessing the social impact of restoring polluted lakes.

Other reports to follow will deal with the social impacts at specific lake restoration sites.

A. F. Bartsch
Director, CERL

ABSTRACT

This research was initiated in order to examine the social implications of lake restoration programs and to develop a standardized methodology for social impact assessment.

A cultural ecological model is employed since it provides perspectives on the relationship of human adaptation and cultural development in evolutionary terms. Use of the model calls for examination of both spatial and temporal parameters. Temporal phases include planning, lake treatment, and restored lake conditions. Spatial parameters include both primary and secondary geographical zones of project influence. The model has not been tested in a specific research environment, but it has been developed from strategies which have proved effective in examining the social impacts of public works projects.

A general research strategy is set forth to encompass historical, geographical and ethnological components in a cultural setting. Data are quantified for a contemporary social profile, and for projections with and without project implementation. All data are examined in terms of five instrumental cultural functions. Criteria for socio-cultural assessment are employed from a research matrix.

This report was submitted in fulfillment of Purchase Order CC6991885-A by the authors under the sponsorship of the U.S. Environmental Protection Agency. This report covers the period October 1, 1976 to January 1, 1977, and work was completed as of March 1, 1977.

CONTENTS

		Page
Foreword		iii
Abstract		iv
Section		
1.	Purpose and Organizing Assumptions of Document	1
	Orientation to Research Design/Social Assessment	2
2.	The Dynamics of Assessing Lake Restoration	4
	Overview of Lake Restoration Methods/Processes	4
	Application of Water Resources Schemes	5
	Identification of Parameters	5
3.	General Research Strategy	10
	Objectives of Social Assessment Research	10
	Formulation of a Model	11
	Collection and Assemblage of Aggregate Data	13
	Methods of Application and Data Organization	15
4.	Summary of Aggregate Effects/Impacts	26
	Adverse/Beneficial Effect Identification	26
	Socio-Cultural Assessment Criteria	27
5.	Summary and Recommendations	32
	Summary	32
	Recommendations	32
References		34
Appendices		
A.	Questionnaire Design	37
B.	Statistical Guides	38
C.	Social Aspects of Lake Restoration-Bibliography	39

SECTION 1

PURPOSE AND ORGANIZING ASSUMPTIONS OF DOCUMENT

The primary function of this document is to provide a methodology for research and data analysis to assess the social impact of lake restoration programs. It carries an implied second function, i.e., a device to assess adequacy of social impact analysis. Although the plan has not been field tested, it has been developed from strategies which have proved efficent and effective in examining the social impacts of other public works programs, e.g. dams (Hogg and Honey 1976; Hogg and Smith 1971). The plan and associated methodology will need to be modified for actual test situations to determine the overall applicability to lake restoration projects.

This work is guided by the specific objective of developing a general research strategy applicable to social impact assessments of lake restoration programs and projects. Some of our previous works (Hogg and Smith 1971; Hogg and Honey 1976) and those of other social scientists in the water resources field (Peterson 1971; Bauer 1973; Burch 1967; Drucker 1974) suggest that the social impacts of lake restoration are not only generated by the construction and operation of new facilities, but that early and advanced stages of planning carry important social impacts as well (cf. Burdge and Ludke 1970).

Different patterns of development, including different sequences and designs for subsequent human use, have varying impacts on inhabitants in the affected area (cf. White 1969). These patterns and sequences also strongly affect the support and facility use of people in other locales (Hogg and Honey 1976). Moreover, the location of the development appears to be a critical factor in determining the intensity and range of its social and other impacts (cf. Napier 1973). Lake restoration efforts would appear to be no exception to such general observations. Since lake restoration has not been described or analyzed from a social perspective, it is essential to identify and describe the range and types of social impacts before any sophisticated analysis of their functions and significance is attempted.

Little if any work has been devoted to assessing the social consequences of lake restoration. In fact, until recently the physical and biological processes of lake restoration have received little attention. Citizen concern has developed late; only in the past five years have the social impacts of such resource developments come to public attention.

Similar circumstances have existed for the general field of water resource developments, including major public works such as dams, irrigation and reclamation schemes. No public commitment to assessing the social

implications of public works existed until the legislation and programs of the 1960s. In 1968, the National Water Commission was established to make recommendations to improve policies dealing with the protection, development, and use of the nation's water resources; and in 1969 the National Environmental Policy Act (PL 91-190) was created and adopted.

Socially pertinent legislation has continued into the 1970s. Many public agencies began to adopt and modify existing guidelines and procedures to fit their own requirements and missions. Most became concerned with the "overall" effects of public works programs. The United States Department of Interior, Bureau of Reclamation, for example, prepared the Guidelines for Implementing Principles and Standards for Multi-Objective Planning of Water Resources in 1972. At this same time, the Department of the Army established their guidelines for the same assessment from PL 91-611 Section 122, and from PL 91-190 (NEPA). Since this time other public agencies have established various guidelines and criteria for overall impact assessments of public works. One of the most important was the Establishment of the Principle and Standards, Vol. 38, No. 174 of the Federal Register published in 1973. In this publication the U.S. Water Resources Council created mandates for all federally funded or sponsored projects. One principal component is the requirement to measure the impact of all public works projects upon the quality of life and social well-being of the affected population.

All legislation during the 1960s and 1970s has been aided by the growing realization among social scientists that such developments were a legitimate research province. This combination of public policy and social awareness has contributed to a change in directions and the development of a new body of knowledge concerning the impacts and effects of varied kinds of water resource developments. More recent legislation and subsequent program funding have further stimulated research and interests in the social processes related to these developments.

ORIENTATION TO RESEARCH DESIGN/SOCIAL ASSESSMENT

The orientation of this manual is derived from theories of cultural ecology (cf. Rappaport 1971). The general theme and framework of cultural ecological studies call for an examination of relationships between cultural and environmental phenomena. The technologies, social behaviors and attitudes of human populations are elements of what anthropologists call "culture." The elements of culture are presumed to be linked together and to relate to environmental features of the human habitat. They relate to environment in the present, and are derived from relationships that have prevailed in a region's past. The intelligibility of present cultural patterns comes from our ability to relate them to the past and to project them into the future.

One of the unique features of human culture is its transmissability through time. As changes in environment occur, changes also must occur in related cultural patterns--if human adaptation is to take place. Likewise certain cultural changes necessitate environmental modification to develop or maintain a reciprocal relationship between culture and environment.

The past and present choices of human populations for gaining a living, establishing and maintaining communities, and justifying and explaining their existence relate strongly to habitat. The choices that humans have made and continue to make are, on either a personal or institutional level, cultural responses to the demands that they perceive to be operating in the environmental setting. The history of a people has established many of the values out of which they base their present actions and, in part at least, determines the manner in which they perceive both opportunities and limitations in their present lives. Therein lies the intelligibility of present cultural phenomena so far as most people are concerned. Since human populations are an integral part of the concept of ecology, it follows that the interaction of physical, biological, and cultural features within a given locale should be the ultimate concern of any environmental impact study (cf. Steward 1955).

Social impact assessment is an essential part of the environmental assessment process at a given locale or region. An over-emphasis on any single part of an environmental assessment will result in under-emphasis on other parts and thus lead to significant omissions of data on relevant forces and processes in development. To avoid such imbalances and omissions, social impact assessment must be a process of detailed data gathering and analysis that determines ranges and intensities of effects on a given social circumstance. It is, in itself, an iterative process. Social impacts constitute any changes in the social structure, values and behaviors of human populations that occur as a direct or indirect result of implementing a developmental plan (cf. Fitzsimmons et al. 1975). The evaluation of such impacts usually is further quantified on a variable scale measuring beneficial and adverse effects in the overall relationship to the quality of life and social well-being of people affected.

Our own approach to social impact assessment is embraced by the themes of adaptation. We pose the question: How will the implementation of a proposed lake restoration project affect the cultural-environmental relationship, and in what manner will populations be able to cope with the presence of such projects? A specification of the interaction of the physical, biological, and cultural systems represented is viewed as providing planners and decision makers with the data necessary to make an effective evaluation of a given project and thus they can take appropriate measures to mitigate serious adverse consequences.

SECTION 2

THE DYNAMICS OF ASSESSING LAKE RESTORATION

OVERVIEW OF LAKE RESTORATION METHODS/PROCESSES

The process of lake aging is a series of conditionally linked natural phenomena. All lakes evolve through stages from oligotrophic conditions (undernourishment) to mesotrophic and to eutrophic (well nourished) bodies of water. Oligotrophic lakes have higher water quality, and we label them as "pristine." They generally are better suited for a variety of human uses (cf. Powers 1970) according to our variable preferences. Mesotrophic and eutrophic lakes also have important human uses such as for fishing, aquaculture and plant production.

Although eutrophication is a natural process, in recent years it has come to the attention of limnologists that human actions have done much to accelerate it. Many factors contribute to the eutrophication of a given water body under any conditions. These include the water body's size and depth, the quality of nutrient supply through runoff and erosion, drainage basin constraints, and others. One of the single-most important factors to emerge however is the action of man, directly or indirectly, upon these bodies of water. This phenomenon appropriately is referred to as "cultural" eutrophication (cf. Bartsch 1972; cf. Powers 1970; Larson 1970), or the acceleration of the natural evolutionary process through "cultural" stimulus.

The aging process of lakes is not totally irreversible. It has been determined that this deterioration can at least be partially delayed through technological means. Although partial restoration can sometimes occur naturally under specific conditions, it usually is induced by way of technology, another cultural element. The principal objective of most lake restoration projects is to eliminate or reduce the supply of nutrients to the lake. This can be accomplished in two ways: 1) to control nutrients entering the lake by waste treatment, diversion, product modification (e.g. use of low phosphate detergents), etc. and 2) to remove or control nutrients cycling within the lake by dredging, nutrient inactivation, drawdown, etc. Cosmetic treatment simply to treat the symptoms of eutrophication by algacides, rough fish removal, etc., can also be used. The basic problem however will remain (Dunst et al. 1974). In this document we are considering the social impacts of lake restoration through elimination of the cause of accelerated aging.

APPLICATION OF WATER RESOURCES SCHEMES

An initial approach to assess the social implications of lake restoration does not dramatically differ in design from similar research strategies developed for other water resource projects. The construction of dams and their associated water impoundments carry many parallels to lake eutrophication elimination. While specific parameters may differ, the general research focus appears to remain on the ability of a human population to adapt to the presence of a technological innovation (environmental modification) and its social consequences. Regardless of the circumstance, attitudes, values and behaviors are the principal components for investigation in the social research design. In the case of lake restoration, the concept of social assessment implies that lake restoration techniques will create or cause certain social impacts; such impacts may or may not be more subtle than those of the major water resource development projects, depending, of course, on the magnitude of the cultural intervention and the nature of the cultural system upon which it impacts.

The general model we would employ basically evolves from previous social impact research experience at Days Creek (planning phase) and Foster Reservoir (construction phase) in Oregon. A coincidentally similar design was prepared by Abt Associates under a research contract with the Bureau of Reclamation, U.S. Department of the Interior (Fitzsimmons et al. 1975). Many of the concepts and methods regularly employed to study social phenomena are only now being applied to water planning studies. Their application to lake restoration is yet untried. This document is developed in the hope that, as lake restoration studies progress, many of the techniques used to assess the social impacts will be refined and improved, thus broadening the understanding of all aspects of water resource development.

IDENTIFICATION OF PARAMETERS

Parameters or variables of impacts can be categorized initially into two broad dimensions. They are: 1) in spatial dimension (primary and secondary impact areas), and 2) in temporal dimension (long and short term impacts).

Spatial Parameters

A primary impact area usually has close geographical proximity to a project site; i.e., people physically close to the project site will be strongly affected by the planning, construction, and operation phases. A secondary impact area is further removed, but impacts may diffuse from the primary impact area and evoke certain requirements for responses or actions from people or institutions in that adjacent locale. Presumably, one could specify tertiary, quaternary, and other more removed impact areas as well. The spatial delineation of impact areas identifies what types of actions or responses occur, to whom they occur, in what manner they occur, and at what locations they occur.

Temporal Parameters

Impacts also are considered in terms of their short and long run durations, irrespective of how positively or negatively they are assessed. Social responses to the new environmental demands occur at differential rates according to many social factors. Definitions of costs and benefits may be immediate or delayed and they may change as time and experience extend through different phases of development. Experience has shown that planning for development often carries as significant an impact as does actual environmental modification or the operation of new technologies. People perceive opportunities or limitations for themselves differently according to information they obtain from different sources as well as from their direct perceptions of the development. The identification and classification of these parameters or variables is a most difficult and exacting process of research.

Developmental programs and projects can be distinguished according to temporal features implicit in the projects themselves. Most obvious are the phases of planning, construction, and operations of the developed facility. These phases would appear to be applicable to lake restoration as well as to other water resource development projects even though the impacts of "construction" might be different.

Planning Phase--

Once a plan to renew or develop a resource reaches public attention, a conceptually disruptive process is initiated. Individuals and groups immediately may begin debating the issues either privately or in a public forum. Environmentalist and developmentalist interests most often speak in opposition to each other. Some people will view the project as a mechanism for promoting the economic advantages of increased tourism, while others will be skeptical and feel threatened with the thought of increased population. Land use planning and zoning agencies may not even exist in many rural areas. The lack of such agencies can make the community unable to deal with land use problems, speculations, and increased valuation of land.

Institutions and agencies also will become involved. Many may promote the project in order to receive the benefits of a restored lake. It may be beyond their means, however, to handle adequately the population increases of either a seasonal or a permanent nature. Law enforcement agencies are one such example. Social service agencies may be unaware of the problems associated with increased immigration and fail to foresee the constraints that may confront their agency after the project is realized.

Demographic patterns are another area of potential change and disruption. The most immediately noticeable effect may be immigration. Age groupings may become imbalanced with heavy concentrations of young or, in other cases, older and retired persons. Worker immigration might imbalance sex ratios in the population. Generally, however, lake restoration project planning or cause treatment would not be expected to alter demographic patterns significantly.

In some ways the planning phase can be the most stressful of any period of the project. This depends in part upon its duration. Many planning phases for major programs have been known to last for as long as ten years. Communities normally are disrupted by the planning process because of ambiguities affecting individuals and institutions. Other types of planning for improvement are greatly affected. If population relocation is one aspect being considered in order to properly restore a lake, then tensions will be multiplied among members of the population.

There are good possibilities that impacts also will be distributed to the local economy unevenly, creating eventual dilemmas for local business and commerce enterprises. An imbalance of negative and positive effects may occur during the water resource planning phase. Initially positive impacts may be short lived and give way to longer term and more pervasive negative impacts.

Lake Treatment Phase--

Similar circumstances may prevail during the physical implementation of a project, or the lake treatment phase. Community disruption can become broader based particularly if the treatment requires a labor force of any size. Generally it would not be expected. Given a sizable disruption, however, several consequences can be expected. Law enforcement problems can occur over resultant conflicts and illegal activity resulting from any population increases and conflicts of values. The economy also might show some instability. While some retail outlets can be expected to show accelerated sales, the phenomenon usually is short lived. Tourism or subsequently increased density of residents usually does not compensate for eventual losses after treatment. Disruptions may also occur over prior land use practices. In most cases they will change, and strong commitments will be made to other forms of development and community growth. These effects can be positive, but this usually depends upon who is evaluating them and in what manner. Schools, churches, and other community services can feel pressures. Some will have to expand to accommodate labor force families. In some cases agencies and groups overcompensate for their presence.

During treatment, the suspension of normal recreational uses may also pose serious problems and general antagonism to a restoration program. This is especially probable if the lake has had heavy seasonal sports use and treatment eliminates an entire season of activity.

Restored Lake Phase--

It is expected that the restored lake phase will carry the greatest overall impacts to the social and cultural system. The types and intensities of impacts are first determined by the allowable uses of the lake in its restored condition. Especially important is the extent to which the restored lake allows continuation and improvement of previous uses and the extent to which it permits or encourages new uses that conflict with prior interests.

Impacts will vary according to the demographic location of the lake. Urban areas will experience a lesser relative concentration of people simply because of the pre-existing magnitude of population. It is not likely that a restored lake in an urban area in and of itself will attract large numbers of new inhabitants to the urban area. Jobs do that. Should its restored state produce jobs, then the lake will have a specific but limited immigration impact. While the same observations generally hold for rural areas as well, a restored lake can have a relatively greater demographic impact either in terms of attracting permanent settlers or temporary and seasonal recreationists. The general improvement of quality of life manifest in a restored lake also can attract people who otherwise would choose another locale, given equal employment and social opportunities.

Lake restoration inevitably means a requirement for better access roads or trails to the facility. Depending upon prior and restored uses, this also can mean new commercial outlets to serve the area, expanded pressure for residential and commercial zoning adjacent to the restored lake, with economic perturbations felt throughout the community or communities concerned.

Probably the most obvious and far reaching impacts of the restored lake phase come in terms of recreational development. This of course depends on numerous other factors. Restoration can mean restrictions on former hunting and fishing activities or it can create or enhance them. Generally it means greater human access to the resource, be this in terms of swimming, boating or just recreational viewing. The economic spin-offs of increased recreation depend ultimately on the lake's size, previous and potential uses. The availability of the restored lake as a new alternative for recreation carries very positive impacts for most people. Recreational benefits can, however, create a circumstance of increased human activity, concentration, noise and visual pollution that is disturbing to people and costly to responsible agencies.

The lack of specific social research on the restored lake phase leaves discussion in the realm of hypothesis or reasonable assumptions based upon other types of lake development. There is a clear requirement to test these propositions in different demographic contents. As pointed out earlier, a restored lake is still a lake. It thus represents a significantly different situation from the creation of a lake behind a newly constructed dam. The extent of this difference should be assessed in empirical research.

Other Types of Parameters

Some kinds of parameters appear to occur without respect to unique spatial or temporal dimensions of lake restoration. There can emerge a major impact parameter dealing with the disruption of a productive body of water, per se. Although some may view the advanced stages of accelerated eutrophication as unsightly, there are other aspects to be considered. In some cases, the population near the lake may have adapted to the presence, and have placed special values on the harvesting of animals or birds that may be eliminated by restored conditions. Some other prior recreational uses, e.g. boating, may not be affected at all by the lake's new condition. Restoring the lake to a more pristine state, however, could cause losses of certain pastimes, such as fishing for warm water species that residents value.

One must also consider parameters associated with 1) sources of eutrophication, 2) the environmental setting, 3) the community configuration, and 4) use conflicts. Sources of eutrophication should be distinguished by either natural or cultural causes or a combination of the two. In most cases it will be necessary to further identify the circumstances by which the accelerated eutrophication is occurring, e.g. point or non-point sources. This is normally done during the project's planning, regardless of social circumstances.

Initially, consideration should be given to geographical and physical circumstances surrounding the lake. Impacts may be distributed differently in different geographical settings (cf. Fitzsimmons et al. 1975). Whether the lake is in an urban or rural setting could well emerge as a primary consideration in the social assessment. The social assessment parameters of lake restoration in the urban-social environment can vary dramatically from those in a rural environment as pointed out earlier with respect to different phases. Community patterns of social structure and social relationships can be an important impact parameter. Initially, the research should show concern with the seasonal and permanent resident dichotomy. Subsequently, it should be sensitive enough to identify internal conflicts that may emerge throughout the project as a result of changes in community demography. Age, sex, and marital status can emerge as important social variables.

Use of the lake water and adjacent shore will be a significant variable, mainly because of use conflicts that inevitably result from a new development. Disturbances ultimately would be expected to develop over recreational, municipal-industrial, land use and settlement issues. In some circumstances, previously developed spatial or temporal zoning plans can limit a plan to restore an inland body of water. If existing uses have to be changed under restoration conditions, then they may modify municipal, industrial, or recreational uses and call for new plans.

These parameters are by no means an exhaustive list. Others certainly will emerge under an actual empirical situation. Still other impact parameters also must be considered during the planning, lake treatment and restored lake project phases. They nevertheless are exemplary of the range of factors to consider.

SECTION 3

GENERAL RESEARCH STRATEGY

OBJECTIVES OF SOCIAL ASSESSMENT RESEARCH

Although a social impact assessment can be a major contributive feature of a planning design, it is not the final determinant of what can or cannot emerge as the most successful plan or alternative plan. The results of a social impact assessment nevertheless should make a significant contribution to a comprehensive restoration program or to the "overall" project effort (cf. Fitzsimmons et al. 1975).

This contribution will come primarily in terms of identifying probable impacts, beneficial and adverse, as well as in projecting the present social profile into the future both with and without the implementation of a lake restoration program. Of particular interest are the impacts that would be expected to emerge under conditions of plan implementation including treatment of cause and restored lake phases. Impacts are identified as social, but also contain economic and political implications or ramifications.

The social impact assessment design has the purpose and objective of identifying both directions and rates of social change occurring in designated impact areas. These directions and rates are examined under "with" project and "without" project circumstances as noted above, and also under alternative project situations. Key social circumstances addressed should include:

1. Description of the social system without the project.

2. Projection of the probable impact of the proposed action on the social systems.

3. Identification of the probable adverse social effects of the action which cannot be avoided or mitigated.

4. Identification of probable irreversible or irretrievable commitments of resources.

5. Projection of the relationship of local short-term social uses of the environment with the maintenance and enhancement of long-term utility of the environment.

6. Assessment of the probable social effects of alternatives to the proposed action.

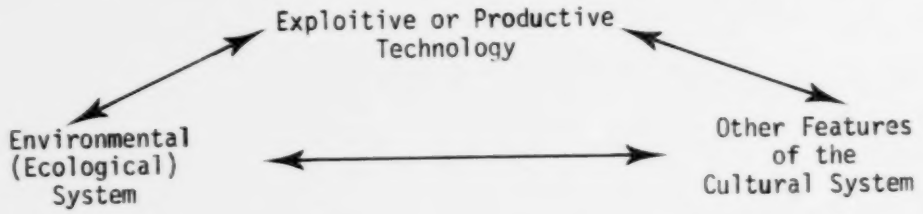
The format for addressing these information categories and providing descriptions and projections of the social profiles of the area includes: a cultural-ecological description and analysis of the setting, including an historical review; a geographical review and an ethnological analysis; a social profile of the present situation; a social profile of the projected characteristics of the area both without and with the implementation of the project; an examination of significant effects; a summary of the effect categories; and conclusions and implications.

Finally it is necessary to design the research in a manner that makes planners cognizant of the needs of people, institutions, and communities (cf. Fitzsimmons et al. 1975). The ultimate success of any development project is in its ability to enhance the quality of life and social well-being of a population.

FORMULATION OF A MODEL

The design and theoretical orientation for social research into lake restoration can be derived from a cultural-ecological model modified after Julian Steward (1955). Steward notes it is useful to consider human adaptation and cultural development in terms of evolutionary processes. The evolutionary model makes explicit the relatedness of cultural and ecological systems, whether they are part of a greater systemic linkage or linked in a causal or developmental manner. The field of cultural ecology takes the linkage into account in terms of three fundamental procedures: 1) analysis of interrelationships of exploitive or productive technology and environment, 2) analysis of human behavioral patterns involved with the exploitation of a given area, and 3) analysis of "the extent to which the behavior patterns entailed in exploiting the environment affect other aspects of culture" (Steward 1955:40-41).

Implicit in Steward's design is the following type of relationship:



The fundamental linkage of the cultural system to environment, according to Steward, is the role of technology; some technological features emerge as more important so far as cultural relatedness is concerned. Conversely, Steward points out the "relevant environmental features depend upon the culture: in that more developed cultures are less dependent upon the environment" (Ibid. 1955:40). Our own work (Hogg and Honey 1976) has caused us to doubt this proposition. In fact, we have found that industrial-urban cultures are more intricately tied to features of environment. Steward nevertheless properly asserts that a full grasp of the relationship can only be attained by a holistic examination of such factors as demography and settlement patterns, land use and tenure, and social structure. To consider

any of these separately runs the risk of failing to note their critical linkages. Only by tracing the history of a culture can we expect to understand its specific nature. An empirical rather than deductive method is essential to the historical reconstruction out of which parallels of form, function, and sequence might be identified (Ibid. 1955:18-19).

The determination of the features of a cultural system's interrelated behavior patterns, as these in turn relate to the environment, is the objective of cultural ecology. The manner in which technology is utilized by a cultural system and the extent to which an environment permits the use of a given technology will vary reciprocally. Cultural ecology, then, seeks to explain the origin of particular cultural features and patterns which characterize different areas.

Of further importance to this model is the concept of "cultural core," or central environmental feature. For the most part, a central environmental feature can only be empirically determined and is usually associated with a long and involved cultural history. The immediate distinguishing significance of the central environmental feature is its interrelationships with primary cultural activities such as subsistence or economy. Examples include lakes, rivers, topographic features, flora and fauna and clearly vary from one cultural context to another.

The appropriateness of Steward's work to social impact assessment of lake restoration projects is seen through the notion of linkage of techno-environmental features to certain kinds of associated behavioral patterns and then to other aspects of culture such as values and attitudes. These are linked in a specific way, one which fundamentally depends on the nature of techno-environmental relationships. Environment thus becomes an effective influence on culture, and provides an explanation of the origins of particular features and patterns of culture which characterize different areas of the world. In this manner, then, cultural evolution can be attributed to new adaptations made by people as required by changing technologies and behaviors in relation to environmental systems.

The Application of the Cultural Ecology Model

The application of Steward's theoretical framework to social impact assessment of a lake restoration program emerges in the form that is diagramatically illustrated in Figure 1. The principal components of the design are as follows: 1) the historical emphasis serves to identify and explain the nature of the central environmental feature and its interrelationship with patterns of culture; and 2) the environmental-cultural system interplay determines to what extent the environment will permit or prohibit technological innovations; and it identifies the special features of the cultural system on which adaptation of people depends.

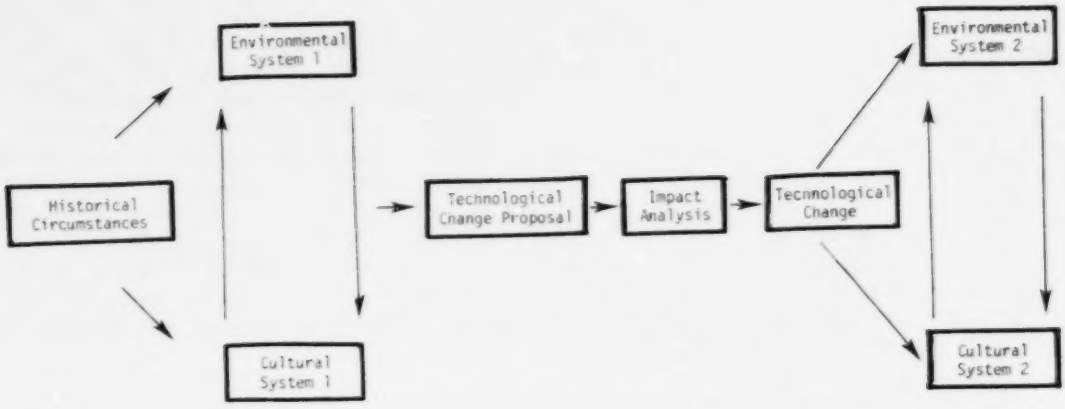


Figure 1. Cultural Ecology and Impact Analysis

The design possesses qualities of a "dynamic systems model" (cf. Fitzsimmons et al. 1975) in that it calls for the observation and analysis of related cultural components such as the economy, resource use and abuse, institutional involvements, and public attitudes. It thus allows for the conceptualization of the cultural-environmental system interaction and the effects of a plan or planning alternatives on people's well-being and their subsequent cultural-environmental circumstance. The application of the design is not restricted by the size or complexity of the project or its setting.

COLLECTION AND ASSEMBLAGE OF AGGREGATE DATA

Data necessarily are gathered in order to adequately describe the contemporary social situation as well as to serve as the base for long range projections. Both primary and secondary sources are necessary to fill data needs.

Initially, researchers should concern themselves with secondary data, or information from books, periodicals, and other printed materials in order to become familiar with the research area. This is usually accomplished in conjunction with preliminary primary data derived from onsite visits for reconnaissance and orientation. During this period, some general questions may also be directed to local residents for preliminary observations concerning the proposed project. This also can be done with a few agency and institution representatives. Secondary sources have additional utility in that they will provide for a significant portion of the subsequent research report, offering a context for primary observations. They serve to outline the history, environment, economy, and other general features of the study area. Most pertinent secondary sources should be consulted prior to field investigations. Secondary sources also will fill existing data gaps and are useful in explaining certain ambiguities that might emerge during the primary research. They further provide the researcher with a tentative profile of the social situation prior to field work. This is important for establishing

sensible forms of primary inquiry, especially for survey work and the construction of an appropriate questionnaire.

Primary data sources are of two types: 1) data collected from key informants and 2) data obtained from a representative sample of residents in the designated impact area/areas. Key informants usually are individuals who are connected with public agencies or institutions and who can provide pertinent technical information. People in this capacity normally provide a quantity of secondary sources of information. They can speak about the policies and position of their particular agency or institution and how it will be affected by the proposed project. Other key informants may be people who, regardless of official position, possess an unusual amount of knowledge about the planning and/or impact area. In many cases these individuals are able to supplement inadequate secondary sources of information; for example historical materials.

Primary information from residents also can be divided into two classes: 1) data from the immediate site area and 2) data from the larger planning area. Regardless of what research instrument is utilized, care must be taken to distinguish the responses of the people falling into these two classes. The utility of the primary source is that it provides the researcher with an in-depth account of residents' attitudes and social characteristics. Secondary sources help to explain the reason for such factors, or provide a context for their explanation. Together they constitute the social profile and the effects anticipated by the residents.

Research Tools

For social impact assessment studies, the questionnaire often is the most useful research instrument since it can adequately handle a large sample quite efficiently. It provides a great amount of data on a large population in a short period of time. It extracts biographical and attitudinal data in a manner that provides quantitative material for development of the social profile. The questionnaire should be designed and constructed to minimize observer bias and to permit easy tabulation and correlation of materials. The instrument should be succinct, so as not to over-burden respondents and the analysis process with irrelevancies. (For a detailed bibliography of question design and questionnaire construction see Appendix A.)

Survey research using questionnaires is but one avenue open to adequate data acquisition. Participant observation is equally important and has been a key feature of anthropological inquiry for many years. It essentially calls for the researcher's residence in the research setting and the observation of daily activities and routine. The internalization of these patterns is far more than just "going native"; it serves as a knowledge base against which enumerative data from one-time surveys can be evaluated. It also serves as a basis for developing sensibly more refined techniques, including questionnaires, projective tests and other devices such as ratings and rankings (Pelto 1970:90-91).

Impact analysis more often deals with enumerative aggregate data rather than with individual case studies or biographies. It is convenient therefore to use computers and statistical measurement techniques for data tabulation and analysis. There are many good source programs and statistical packages for analysis of aggregative data. Appendix B lists some which are very helpful. Case data derived from specific contexts and no less scientific, also are amenable to quantitative treatment but more often this entails a slower deductive kind of analysis. Case data utility in impact analysis should not be understated. It is an important check on the accuracy of conclusions drawn from aggregate data and it allows depth study of relationships between parts in a social system (cf. Sjoberg and Nett 1968:258-264).

METHODS OF APPLICATION AND DATA ORGANIZATION

Cultural Ecology

The application of the cultural ecology framework to social impact analysis establishes a comprehensive requirement for data and explanation not realized in methods of lesser breadth. As already emphasized, this method demands historical, geographical, and ethnological information and requires a specification of their relationships. Properly employed, a cultural ecological study may show basic developmental patterns that have led to the present social circumstances of an area planned for subsequent development. Insofar as it specifies process through time, it allows intelligible projections of future circumstances based upon knowledge of definite cultural processes operant in the present.

The historical component of cultural ecology is derived from cultural reconstruction methods linking prehistorical phenomena to the ethnographic situations of aboriginal populations at the time of initial contact, to early Euro-American exploration and settlement, including an explanation of the motivations and attractions for that settlement. Sources for history mainly are of the secondary variety and are drawn from libraries, museums and historical societies. In cases where the written record is sparse it becomes necessary to use a number of different types of data and methods to accomplish historical reconstruction (cf. Gabel and Bennett 1967). It customarily requires finding primary sources, mainly through interviews, to collect geneologies, life histories, oral histories and the like, but also requires examination of artifacts from historical periods.

The historical summary[1] should at least contain the following items:

a. A General Description of the Prehistorical Situation

b. A Description of Aboriginal Lifestyles

   1. Group diversity and uniformity

---

[1]Such a summary presumes the pertinence of the lake restoration project to prehistorical and historical sites. An initial survey is required to determine this.

2. Intertribal relations

3. Native economy: subsistence, trade, property concepts, etc.

4. Migration and population patterns

5. Interaction with early whites

c. Initial Exploration and Settlement by Euro-Americans, e.g.

1. Influence during trapper and trader era

2. Other external influences: missionary, etc.

3. Orientation to environment

d. Permanent Euro-American Settlement

1. Motivations

2. Early economy

3. Growth patterns

4. Major historical events

5. Significant changes

Geographical data also play a fundamental role in a cultural ecology study. The spatial dimension of cultural activities is used both to describe and to interpret both in the past and the present. Whereas the history recounts and links events leading to the planned development, the geography provides a description of the environmental circumstance in which the events occur. The primary consideration here is upon environment and human interaction with the environment, especially the exploitive or productive technologies. Properly developed, this component should describe and analyze environmental features such as physiography, flora, fauna, climate and hydrology, human population characteristics and viability; natural resource use and development, including the technologies that are brought to bear upon it.

Ethnological data are central to all cultural ecological description and interpretation. These are developed in order to examine the relationship of technologies and environmental features to the full range of cultural factors that are affected by the developmental plan. Ethnology represents an attempt to "understand how total cultures are constituted and how they work" (Honigmann 1959:5). The ethnological framework includes sociological as well as technological and attitudinal variables.

Ethnological data pertain to several levels of inquiry ranging from those pertinent to the individual to those processes and phenomena that pertain to inter-personal, to inter-group, and to total societal levels. The

culture concept includes each of the aforementioned levels of human activities and thus is the generic concept for this holestic study as prescribed in the methodology of Julian Steward (1955).

With regard to lake restoration programs and ethnological phenomena, we require 1) the isolation of relevant variables or parameters in both, 2) the postulation of the relationships between the properties of both (model construction), and an examination of the precise nature of these relationships in an empirical setting (Hogg 1966). Historical and geographical considerations help specify these relationships in the time-space dimensions required. Together with the ethnological identification and analysis, they provide a full context for a basic social profile of the setting.

Development of a Social Profile

The social profile should furnish enough information so that any pertinent problem or need is clearly illustrated and well defined. Sometimes impact areas are pre-defined by planners, in other cases they are not. Boundaries usually are arbitrarily defined to conform to a hydrologic system or a political unit. They may or may not represent a social reality to people of the area. Real social boundaries must be determined through the social research process by investigating people's ideas about the systems of which they are a part.

Several other components are needed to describe the social system of an area or community as it exists prior to the implementation of a restoration program. These are 1) demographic and biographic characteristics of the people, 2) social characteristics including neighborhoods, communities, associations, education and recreation, 3) socio-economic characteristics, including occupation and income, 4) socio-political characteristics, 5) environmental-aesthetic attitudes, 6) resource development attitudes, and 7) socio-psychological attributes of the population. Given this substantial baseline, it is possible to make reasonable projections as to what can then emerge from future circumstances, including the implementation of specific development plans.

Demographic and Biographical Characteristics of the Population--

Data for this component will come both from primary and secondary sources. They should include the following: population at local, county, state, and/or regional levels; population densities; population growth; migration trends; age and sex compositions; vital statistics, and any relationships to county, state or regional population patterns of distribution.

Biographical data will be obtained from interviews of a sample of area/community residents. These include subjects of provenience, age and sex composition, mobility phenomena, kin group affiliation, marital status, and types and length of residence. Other necessary data include occupation, income, household characteristics, voluntary association involvements, and educational attainment. Such would represent a minimum requirement for an

adequate biographical index. Many researchers will add other data pertaining to their own particular interests or problem.

Social Characteristics--

In addition to social data derived from a survey instrument, data must be acquired from supplementary sources. Sufficient data must be gathered to effectively depict how well the population is provided for in terms of social and other services; with whom they interact and in what manner the interaction takes place; and to describe any other interactions or interdependencies that might exist of a social nature; e.g. extent of interaction with their environment.[1] Such characteristics are necessary to determine existing gaps or adaptive imbalances in activities. The following outline provides a baseline.

a. Public or Community Services

   1. Public utilities: number and types

   2. Museums, libraries: number and types

   3. Civic oriented groups: number and types

   4. Types of services for population

b. Voluntary Organizations

   1. Types and membership

   2. Functions

   3. Locations

c. Housing

   1. Total number of units

   2. Number occupied by renter/owner/leaser

   3. Vacancy rates

   4. Age and condition

---

[1]For a listing of socio-metric scales and listings consult Delbert Miller, Handbook of Research Design and Social Measurement, Second Edition, David McKay Co., New York, 1964. See also Pelto, P., Anthropological Research: The Structure of Inquiry, Harper and Row, New York, 1970 and Kaplan, Abraham, The Conduct of Inquiry, Chandler Press, San Francisco, 1974.

5. Racial/ethnic trends of occupancy

6. Construction rates and trends

d. Education

1. Sample characteristics in relation to relevant county, state or other figures

2. Number and types of facilities available

3. Pupil-teacher ratios

4. Total enrollments by type of facility

5. Capacities of facilities and needs for improvement

6. Identification of funding or budget problems

e. Recreation

1. Inventory of existing facilities by type and function

2. Recreational space vs. demands and/or requirements for same

3. Sample recreational characteristics and attitudes.

f. Emergency preparedness

1. Types of services available

2. Pertinent statistics, e.g. crime rates

3. Size of services available in relation to needs or demands

4. Jurisdictions

5. Status of facilities

g. Communication--quantity of mass media facilities and location/ distribution.

Socio-Economic Characteristics--

Characteristics of a socio-economic nature are used primarily in the identification of general exchanges or allocations of goods and services as well as direct or indirect market-value changes in the use of resources that relate to a development project. These characteristics are an integral portion of social activities. The collection of the following data is necessary to adequately depict the socio-economic circumstance of the area.

a. Economic Base and Development Trends

1. Identification of major subsistence base for population components

2. Identification of any trends or recent changes in economy

3. Identification of disruptive factors such as recessions, or growth phenomena such as new market advantages

4. Influence from external factors, such as war, inflation, etc.

b. Employment Characteristics

1. Number and types of business/industrial/agricultural activities

2. Size and distribution of same

3. Total in labor forces

4. Amount of employment by type of activity

c. Income Distribution

1. By sample and area/community

2. Median incomes and income variability

3. Family income

4. Redistribution phenomena

d. Tax Base

1. Rate means and variations

2. Attitudes toward

3. Additional income levies

e. Transportation

1. Highway systems and networks

2. Rail systems

3. Airports

4. Port facilities, if any

5. Dominant patterns

6. Needs and demands

Socio-Political Factors--

This category is an important component in identifying the political configuration within the planning area. It includes the principal political elements and functions of these elements, the adequacy of services and facilities as determined by the researchers and as perceived by the residents. The political process of a planning area, individual involvements and perceptions are an important consideration in a social profile. The profile includes a description of means for providing control, order and security for residents of the area. Political factors include:

a. Residents' attitudes toward and extent of involvement with political systems

b. Type and number of government agencies at various levels

c. Jurisdictions relative to development plans

d. Specialized activities

e. Identification of significant political issues, including the planned development

Environmental-Aesthetic Factors--

Although a large portion of these data can be collected by way of the survey instrument, additional information is needed to place such data into a proper perspective. Much of this phase of investigation is directed toward determining population environmental-aesthetic orientations and commitments, as well as obtaining plans and policy information of a land use planning, zoning, and development nature. Planning has been shown to require compatibility with the desires and needs of the population. All land use trends must therefore be identified. More often than not, resource development plans do not receive proper consideration in land use comprehensive plans. Major components of an environment-aesthetic description and analysis include:

a. Measurement of sample perceptions toward natural and man-made objects

b. Extent of environmental-aesthetic oriented activities

c. Organizations concerned, and membership

d. Individual self-evaluation of environmental awareness and activity in organizations

e. Land use patterns and plans

f. Quality of life assessment

Water Resource Development Attitudes--

General water resource attitudes can provide researchers with initial environmentalist-developmentalist distinctions that may operate within the population. People have strongly developed perceptions and ideas concerning water and its usage. The following items are necessary to determine how people view cultural change within their system as a result of a proposed project. They also determine the (positive or negative) manner in which people perceive the change as it is evaluated according to their own experience and expectations.

a. Extent and types of existing development

b. Individual experience with water resource developments

c. Awareness of project

d. Chief correlates of favor or disfavor of project

Social-Psychological Adaptibility to Change--

Rather than select specific sub-components that need to be examined, it should be noted that a host of social-psychological testing and scaling techniques exist to assess this characteristic. Any small number of scales contained within a broad research instrument cannot offer a definitive evaluation of individual capacities or abilities to adapt to changes that may confront them. The significance of developing this component is that it offers insights as to residents' self-evaluation concerning their place in life and within the community. It has a strong bearing on quality of life assessment.

Social System Boundaries--

This constitutes a summary of social characteristics involving attitudes and behaviors of respondents towards three principal categories listed below. All previous data collected will provide the baseline for identifying these boundaries and the degrees of factionalization that might exist. Subsystems may also be operating and it will be necessary to identify these operating systems, to what extent they operate and how they may affiliate themselves.

1. Community homogeneity and identity

2. Heterogeneity from social and ethnic groups

3. Rural resident affiliations to adjacent town and urban centers

The above suggested components are necessary to adequately identify and develop the social profile. The profile may need modification depending upon the circumstances of the research. It can best be described by graphs, charts and accompanying narrative (cf. Fitzsimmons et al. 1975).

Adaptive Qualities and Impact Assessment

Projections without plan implementation--

Once the social profile is completed, the next consideration is the projection of the social environment into the future without the implementation of the proposed project. The boundaries of cultural systems, like ecological systems, fluctuate and change according to certain internal and external factors. A temporal boundary of a cultural system will last indefinitely until human extinction, disorganization, disinterest, or departure deem otherwise. The study of such changing systems and projections of their future requirements are the basis for assessing what trends or tendencies come out of the past and what kind of configuration they will manifest in the present and future. All previous materials and the present profile are utilized in such projections.

A projection of changes without the implemented plan is used as a comparison against the later with-plan projection in order to isolate impacts of the plan itself. Within the present social situation for a given population, various factors are operating as mechanisms for the continuance of the culture and environmental system. Many such mechanisms function as community cohesion and adaption devices. They should be examined in light of five instrumental cultural functions.

1. Population Physical Well-Being - Items instrumental to the continuing viability of a given population include population growth or maintenance, migration and provisions that are made institutionally for land use planning, fire protection, law enforcement, medical facilities, and other safe-guard measures.

2. Enhancement of Livelihood - This function includes factors relating to the ability of an area to provide subsistence for its inhabitants on a continuing basis. It involves continuing employment opportunities, housing availability, voluntary associations, and so on.

3. Community - The present cultural-environmental relationship must allow for the development of a community where individual social needs are satisfied and the development and maintenance of institutions are permitted. There must be a continuing community identity for the inhabitants.

4. Communication - The cultural-environmental relationship must allow for the continuation of sufficient communication to transmit meaningful and necessary knowledge and information between individuals and communities. Included would be improved transportation networks and mass media forms, and minimization of social conflict between community elements.

5. Innovation - The situation must allow sufficient innovation opportunity to permit a cultural diversity necessary for cultural continuance in the changing environment. Of primary consideration is the impact of technological innovation upon the quality of life and social well-being.

These five functions are clearly related and in any given circumstance can be met singly or multiply by one or several institutions. The major consideration is their instrumentality to the survival of human beings and their cultural system in a given ecological province. With respect to lake restoration projects, the functions serve as a guide to evaluative criteria in a full cultural sense. Concern should be with the extent to which the proposed scheme or its alternatives limit or provide opportunities with respect to these functions. Should present cultural-environmental circumstances disclose that these functions are being met, then the effects assessment should reflect a judgment of the adaptation of the cultural system. Should these functions not be met, then the assessment should specify the extent of maladaptation.

Projection of Social System with Project--

The data for the present social situation serve as the primary baseline for projections of future circumstances given project implementation. Projections are to illustrate, as accurately as possible, any changes in the social structure, beliefs, values, attitudes, and behaviors that might occur as a result of the project. They also are used in conjunction with the "without project" profile in order to determine or isolate all significant beneficial and/or adverse impacts that would arise from other operant or anticipated events.

Projections are premised upon the idea that if a technological development occurs, change is expected within the cultural-environmental interplay (cf. Foster 1962) regardless of whether or not the process involves major construction or correction of cause treatment. Even the most minor actions carry impacts for the cultural and environmental relationships.

Information for projections with project implementation is drawn from the present social profile and is supplemented with data provided by public and private agencies. Other data are derived from people's perceptions of and feelings about change that might occur as a result of a planning or construction phase of a project. These are essential to projecting their probable actions. So, too, are statistical projections based on trends revealed in the present situation. All information collected can be examined in light of the instrumental cultural functions previously discussed in order to determine the extent of the imbalance, if any.

Once the "with project" and "without project" comparisons are made, and the significant effects categories emerge, social-cultural assessment criteria can be applied. These become the basis for reasonable judgments about the success of a given restoration project within a given cultural-environmental system. They are addressed in a later section of this manual.

Quality of Life and Social Well-Being--

Quality of life and social well-being assessments are difficult to quantify except through the measurement of individual attitudes or preferences on other operationalized concepts. They differ with respect to subjective and objective criteria. The quality of life includes measures of social well-being and happiness; it is a subjective measurement of individual satisfactions with his/her position in a cultural-enviornmental situation. Social well-being is more of an objective measurement in which observations are made as to people's income, physical and mental health, nutrition, education, and so on (cf. Smith 1973). Criteria assigned to social well-being are usually established by research designers. The more subjective quality of life phenomenon is assessed through determining a person's experience and the orientation of his or her lifestyle. Both are equally important.

A major difficulty facing all steps of any planning process has been the stated need to mirror community sentiments and preferences in order to devise an adequate quality of life and social well-being index. This recognition of need, of course, presumes that such planning is optimal only if it reflects public preferences and that somehow a collective intelligence emerges from summary effects of the full range of public preferences. Such a presumption is debatable.

Social well-being usually is thought of as a measurement of the quality of life or a general state of happiness and contentment. Implicit is the idea that quality of life and social well-being are direct correlates, one a subjective mirror of the objective other. It therefore is assumed that as one increases the quality of life for population, there is automatically an increased in social well-being. Smith (1973) has clearly demonstrated that one is not a function of the other--that they are quite different phenomena. We agree with his distinction.

The effect of a plan on the quality of life and social well-being of a population is measured and identified mainly through the survey instrument or through interviews. Interpretation of data should be concerned mainly with how change will affect these dimensions of a population. Criteria for such assessment include the ability of a population to maintain its physical well-being, subsistence base, community identity and maintenance, communication network, and innovative potential (Hogg and Honey 1976).

SECTION 4

SUMMARY OF AGGREGATE EFFECTS/IMPACTS

ADVERSE/BENEFICIAL EFFECT IDENTIFICATION

The preceding section has offered general guidelines on the development of criteria for the social impact assessment of lake restoration projects and any other water resource development. The ultimate objective of assessment is to identify which effects will be adverse and which ones will be beneficial for a given population. Of additional importance is a determination of how long each effect will last and the strength of its impact in different locales. Again it is necessary to return to the cultural-environmental system, its historical configuration, development, and present profile.

Beneficial effects will generally be those effects which in some manner contribute to the enhancement of the quality of life/social well-being of a population through an equitable distribution of income, employment, and other social opportunities. Adverse effects are detrimental impacts on a population in terms of creating an imbalance of any of the instrumental cultural functions thereby causing actual or potential maladaptation. In some cases the absence of a plan may cause adverse effects. It has been shown that the presence of a plan also may generate adverse effects. The plan itself is an efficient causal agent and should be evaluated as a parameter of development.

A significant feature of any developmental scheme is the matter of "trade-off," or people's relative perceptions and choices between costs and benefits. Although recreation, for example, may have the potential of enhancing and developing the economy under a restoration project, it may increase tourism to the point of adversity for local residents. If the economic potential of tourism eventually outweighs the territorial intrusion, then residents usually will sacrifice for the economic benefits. Their choice is the "trade-off." Beneficial and adverse effects can be generated at the same time (cf. Fitzsimmons et al. 1975) and create dilemmas over a wide number of subject areas, e.g., economy vs. environment, aesthetics vs. jobs, etc.

In some instances beneficial effects may outweigh adverse effects, especially in terms of increasing economic opportunities in depressed areas or communities. Individuals may be willing to sacrifice environmental features to improve job availabilities or other economic circumstances. Different plans thus generate different effects. Each alternative therefore must be analyzed in a relative manner and in light of its own consequences.

SOCIO-CULTURAL ASSESSMENT CRITERIA

The success of a technological development eventually is determined by the extent to which the cultural-environmental setting can be improved by its presence or absorb its impact with a minimum of disruption. The research must strive to identify the significant effects of a plan on the social system of a given population and assess its relative significance in terms of effect categories which would emerge from the social profile comparisons.

A significant effect is one which would be considered to have important bearing or weight on any decision making process. Significant effects categories can be employed from various perspectives. For this research we would propose three sets of effects categories: They are 1) a detailed matrix of all significant variables from the research, 2) special cultural sub-system categories; i.e., economic and political, social, aesthetic and 3) instrumental cultural functions.

Matrix of Variables

Variables employed in a research matrix constitute the initial perceptual and analytical framework for the research. Their logical combination into balanced sets of more general categories is made difficult because in some cases the variables may actually constitute incomparable social processes. They can take the form and function either of behaviors or attitudes. Usually they should be assessed in terms of their original matrix pattern. Figure 2 illustrates a hypothetical situation where each variable is given a summary description of its effect significance. They are shown in terms of the following assessment categories: insignificant (I), moderately significant (MS), extremely significant (ES), and questionable future circumstance (QFC).

Figure 2

MATRIX OF SIGNIFICANT EFFECTS CATEGORIES

Effects categories	Effects assessment			
	I	MS	ES	QFC
Economic variables-individual involvement				
Present job and occupation				
Labor force characteristics.				
Employment opportunities				
Real income and distribution				

(continued)

Figure 2 continued

Effects categories	Effects assessment			
	I	MS	ES	QFC
Housing				
Quality and size				
Availabilities				
Relocation assistance desired				
Property Ownership				
Size and value				
Use of property				
Lake frontage				
Water needs and problems				
Available replacement property				
Property replacement assistance desired				
Problems anticipated with replacement				
Transportation				
Journey to work				
Travel for shopping				
Travel for recreation				
Farming activities				
Type of farming activity				
Irrigation practices and needs				
Economic variables				
Perception of economic structure in area				
Anticipation of future economic benefits to self and others				
Restoration/no restoration alternatives				
Property taxes and other local taxes				
Political variables-institutional				
Residents' participation in politics				
Residents' perception of political opportunity structure in local area				
Residents' attitudes toward government at all levels				

(continued)

Figure 2 continued

Effects categories	Effects assessment			
	I	MS	ES	QFC
Social variables				
Neighborhood, community and area relations .				
Interaction with kin; location of kin. . . .				
Neighborhood, community and area preference for residence				
Present attitudes toward neighborhood, community and area				
Attitudes toward, and perceptions of, change in neighborhood, community and area				
Attitudes toward increased recreationists in area.				
Attitudes to family and kin; preferences for involvement with kin				
Participation in voluntary organizations . .				
Voluntary associations preferences				
Recreational preferences				
Attitudes toward out-migration				
Attitudes toward migrating into area				
Community which provides norms and values. .				
Community by which one measures one's own accomplishments.				
Perceptions of social opportunity structures				
Social services availability and provision				
Schools: number, size, location, capacity for growth or contraction.				
Churches: number, size, location, denomination, capacity for growth or contraction				
Resource utilization				
Residents' perceptions of what man's roles should be in natural resource utilization and modification.				
Residents' perceptions of whether they are leading the kind of life they prefer for themselves				

(continued)

Figure 2 continued

Effects categories	Effects assessment			
	I	MS	ES	QFC
Engagement in historical preservation activities				
Attitude toward historical preservation programs				
Lake restoration variables				
Attitudes toward lake restoration				
Perceptions of changes derived from lake restoration				
Environmental variables				
Land use patterns and plans				
Noise: residents' perceptions of noise				
Visual quality of area: residents' perceptions of visual quality				
Population characteristics				
Population density				
Population movement				
Population health				
Individual adaptability to change				
Relocation				
Occupation flexibility and independence of property				
Social-psychological				

The research should exercise appropriate caution in using summary designations as hard and fast details of fact with which quick conclusions can be made. In some cases the summary designation must be made in reference to conflicting information on the basis of attitudinal ambivalence reflected in a data base. In all cases, these judgmental summary assessments should be used in reference to the fuller description contained in the body of the social impact assessment.

Cultural Subsystems

Cultural subsystems are distinctive sets of behaviors and attitudes that are definable according to the unique functions they serve. They consist of exchange systems for goods and services (economic); systems of control and order, as well as security services (political); systems

or basic association through such factors as age, sex, family, kinship, and voluntary association (social); systems of supernaturalism (magico-religious); and artistic expression through plastic and graphic arts, music, poetry, etc. (aesthetic). Other such sets can be identified, but these serve as major categories for behaviors and attitudes as we have come to consider them in western science.

The use of such categories in social impact assessment is manifold. First, they constitute a typology of socio-cultural phenomena. Second, they serve as a guide to sufficient breadth of inquiry. Third, they allow inter-setting, as well as intra-setting, comparisons of major functions over time and space. Fourth, they can serve as a general criteria in evaluating the extent to which developments ramify and impact upon different aspects of human culture.

Instrumental Cultural Functions

A third set of effects categories is developed out of instrumental cultural functions employed as a set of criteria to examine cultural-environmental interplay both as it presently exists, and as it is to be affected by implementation of a plan. To reiterate, these are: 1) population physical well-being (viability criteria), 2) enhancement of livelihood (subsistence criteria), 3) community (social needs criteria), 4) communication (knowledge criteria), and 5) innovation (diversity criteria). Like the cultural subsystems, these categories and related criteria have use in determining breadth and sufficiency of research, and establishing comparisons. The instrumental functions are chief factors in assessment criteria insofar as they relate so directly to the cultural ecology model and to key social circumstances required of social impact analysis.

Within these several domains of criteria, several chief effects will emerge. It is important to note any summaries, conclusions, and/or implications that may derive from the effects categories. In some cases recommendations can be made as to certain courses of action to be considered in the planning endeavor. The research should be designed to present objective insights into the effects of lake restoration programs as they relate to cultural-environmental systems in a lake setting. The final statement should provide conclusions regarding the positive and negative effects of the lake restoration project on the affected community.

SECTION 5

SUMMARY AND RECOMMENDATIONS

SUMMARY

This report has offered a general set of guidelines and assumptions for social assessment of lake restoration programs. It was written with a mind not so much to say specifically "how to" accomplish the assessment but, rather, to discuss the range of factors and parameters necessarily involved in such social impact analysis. This discussion to this point has not been lake restoration specific. The elements of strategy provided here are applicable to impact analysis in nearly all types of water resource development. Given the need for standardization of interest in and commitment to social impact assessment by all agencies responsible for developmental programs and projects, and until empirical research is conducted on lake restoration programs, the more general the discussion the better for all concerned.

In turn, the report has discussed the major parameters and social dynamics of lake restoration, specifically addressing spatial and temporal features as well as other impacts. A general research strategy including objectives, model formulations, the collection and assemblage of aggregate data and methods of application was presented. Particularly pertinent here was the description of the cultural ecology model and the fit of data requirements to it. Finally the discussion was devoted to aggregate effects and impacts and how these are assessed.

RECOMMENDATIONS

Data requirements for social impact assessment, in general, have been specified by non-standardized federal guidelines. The extent to which they are pursued in depth depends upon a host of factors including the scope of the lake restoration project, the availability of funds for the research effort, time available for the work and so on. Time and money constraints always seem to be present. Moreover, these limiting factors may be real or they may be manipulated in such a way as to minimize the social assessment in the first place. A failure by agencies to realize the nature of social research often is translated into impossible time lines and unrealistic dollar constraints. Project planning, therefore, should realistically incorporate the time and money for social impact assessment.

To be sure, all of the impacts, relationships and interactions noted herein may be real so far as a lake restoration project of any magnitude is

concerned. The serious question, however, emerges: what is reasonable or relevant so far as the project's magnitude is concerned? The answer in part is provided by the methods selected for employment. A pilot effort or survey type of research can identify areas of relevance or probable high impact. Especially suited to this is the ethnographic method of social anthropology.

A more detailed examination of variables and their interrelationships can be accomplished efficiently if the prior survey work has already identified key variables. A full assessment of all pertinent variables should be the objective in any case and, if limitations prevent it, those limitations should be specified as constraints on the assessment. Subsequently they should be scrutinized as thoroughly as the findings of the assessment.

Thus several levels of assessment may be sought in the project. First involves simply the identification of key social variables where impacts might reasonably be expected. Second, an examination of interrelationships between variables in the social present may be sought in order to establish a baseline for subsequent projections. Third, from these levels research can involve projections of a "without project, with project, and with project alternatives" nature out of which comparisons can be made and significant effects and effect categories can be isolated. The research should specify at its onset the level of understanding sought. It should detail any socio-cultural omissions made.

A "typical" evaluation study of lake restoration projects is hard to specify since none have been conducted. An ideal type study should at least accomplish the steps outlined in this report. Preliminary ethnographic and library research is essential for determining the cultural ecological circumstance of the setting to receive the project. A social profile of a full or limited nature is essential for any meaningful projections of with and without project configurations. The isolation of significant effects categories and effects, as evaluated by meaningful criteria of cultural functioning, is the final and most important step in the typical process.

It should be noted that the social impact assessment is far more than just basic social science research. The ethics of objectivity and social responsibility come head on in a serious circumstance where real people's life quality and social well-being must be carefully examined. Lake restoration is unique in the sense that it is an explicit effort to improve environment and societal functioning. It nevertheless is a form of development and therefore carries impacts for social systems. Recognized as such, it requires social research.

Finally, the cultural ecology framework chosen for use here is selected because of its holistic nature. We have modified Steward's basic propositions to conform more fully with our experience in the impact analysis field. It requires a significant empirical test in lake restoration research in order to be more fully refined and directly relevant to that process.

BIBLIOGRAPHY

Bartsch, A. F. 1972. Role of Phosphorus in Eutrophication. EPA-R3-72-001. National Environmental Research Center, U.S. Environmental Protection Agency, Corvallis, Oregon 97330.

Bauer, E. Jackson. 1973. Assessing the Social Effects of Public Works Projects. Report to the Department of Army, Corps of Engineers, Board of Engineers for Rivers and Harbors, Fort Belvoir, Virginia.

Burch, William. 1967. Social Behavior, Natural Resources and the Environment. Harper and Row, New York.

Burdge, R. and F. L. Ludke. 1970. Factors Affecting Relocation and Response to Reservoir Development. Water Resources Institute, University of Kentucky, Lexington.

Drucker, Phillip, R. Charles and E. Reeves. 1974. Displacement of Persons by Major Public Works: Anthropological Analysis of Social and Cultural Benefits and Costs from Stream Control Measures-Phase 5. Water Resources Research Institute, University of Kentucky, Lexington.

Dunst, R. C., S. Born, P. Uttormark, S. Smith, S. Nichols, J. Peterson, D. Knauer, S. Serns, D. Winter and T. Wirth. 1974. Survey of Lake Rehabilitation Techniques and Experiences. Technical Bulletin No. 75. Department of Natural Resources, Madison.

Fitzsimmons, Stephan, L. Stuart and P. Wolff. 1975. A Guide to the Preparation of the Social Well-Being Account. Social Assessment Manual. Abt Associates, Inc., Cambridge.

Foster, George. 1962. Traditional Cultures and the Impact of Technological Change. Harper and Row, New York.

Gabel, C. and Norman Bennett. 1967. "Introduction" in Reconstructing African Cultural History. Gabel and Bennett (eds.), Boston University Press, Boston.

Hogg, T. C. 1966. Toward Including Ethnological Parameters in River Basin Models. Conference Proceedings on the Economics of Water Resource Development of the Western Agricultural Economic Research Council, December (mimeo).

Hogg, T. C. and C. L. Smith. 1971. Socio-Cultural Impacts of Water Resource Development in the Santiam River Basin. Water Resources Research Institute, WRRI #5, Corvallis.

Hogg, T. C. and W. D. Honey. 1976. Dam the River: The Proposed Days Creek Dam and The Human Ecology of the South Umpqua River Basin, Oregon. Department of Anthropology and Water Resources Research Institute, WRRI #43, Corvallis.

Honigmann, John. 1959. The World of Man. Harper and Row, New York.

Larson, Douglas. 1970. Cultural Impact on Lake Evolution. In: Man and Aquatic Communities, Water Resources Research Institute, Oregon State University, Spring Quarter Seminar Series.

Miller, Delbert. 1970. Handbook of Research Design and Social Measurement. Second Edition, David McKay, Co., New York.

Napier, Ted. 1973. Social-Psychological Responses to Forced Relocation Due to Watershed Development. Water Resources Bulletin, Vol. 8, No. 4, pp. 784-795, Urbana.

Pelto, Pertti J. 1970. Anthropological Research: The Structure of Inquiry. Harper and Row, New York.

Peterson, John H. Jr. 1971. Community Organization and Rural Water System Development. Water Resources Research Institute, Mississippi State University, State College.

Powers, Charles. 1970. Eutrophication of Lakes. In: Man and Aquatic Communities, Water Resources Research Institute, Oregon State University, Spring Quarter Seminar Series.

Rappaport, Roy. 1971. Nature, Culture, and Ecological Anthropology. In: Man, Culture and Society, Harry L. Shapiro (ed.), Oxford Press, New York.

Schields, Mark. 1974. Social Impact Assessment: An Analytic Bibliography. A Report Submitted to the U.S. Army, Corps of Engineers Institute for Water Resources.

Smith, Courtland. 1973. Social Well-Being: Problems and Prospects. In: Proceedings of the Conference on The Social Well-Being and Quality of Life Dimension in Water Resources Planning and Development, Utah State University, Logan, Utah, pp. 190-198.

Sjoberg, G. and R. Nett. 1968. A Methodology for Social Research. Harper and Row, New York.

Steward, Julian. 1955. Theory of Culture Change: The Methodology of Multilinear Evolution. University of Illinois Press, Urbana.

Vayda, Andrew. 1969. Environmental and Cultural Behavior: Ecological Studies in Cultural Anthropology. Natural History Press, Garden City.

White, Gilbert. 1969. Strategies of American Water Management. Ann Arbor Paperbacks, University of Michigan Press, Ann Arbor.

APPENDIX A

QUESTIONNAIRE DESIGN

Backstrom, Charles and Gerald Hursh. 1963. Survey Research. Northwestern University Press, Evanston.

Goode, W. J. and Paul Hatt. 1952. Methods in Social Science. McGraw-Hill, Inc., New York.

Lazarfeld, Paul and Allen Barton. 1962. Some General Principles of Questionnaire Classification. In: The Language of Social Research, Paul Lazarfeld and Morris Rosenberg, Editors, The Free Press, Glencoe.

Miller, Delbert. 1964. Handbook of Research Design and Social Measurement. Second Edition, David McKay Co., New York.

Oppenhiem, N. C. 1966. Questionnaire Design and Attitude Measurement. Basic Books, Inc., New York.

Young, Pauline and Calvin Schmid. 1968. Scientific Surveys and Research. Fourth Edition, Prentice-Hall, Inc., Englewood Cliffs.

APPENDIX B

STATISTICAL GUIDES

Anderson, Theodore and Morris Zeldich. 1968. A Basic Course in Statistics: With Sociological Applications. Second Edition, Holt, Winston, Rinehart, New York.

Berstein, Allen. 1964. A Handbook of Statistical Solutions for the Behavioral Sciences. Holt, Winston, Rinehart, New York.

Conway, Freda. 1967. Sampling: An Introduction for Social Scientists. Humanities Press, Inc., New York.

Edwards, Allen. 1967. Statistical Methods. Second Edition, Holt, Winston, Rinehart, New York.

Maxwell, Albert. 1961. Analyzing Qualitative Data. John Wiley and Sons, Inc., New York.

Weiss, Robert. 1968. Statistics in Social Research. John Wiley and Sons, Inc., New York.

APPENDIX C

SOCIAL ASPECTS OF LAKE RESTORATION

BIBLIOGRAPHY

Andrews, Wade and W. Dunaway. 1975. Changes in Uses of Bear Lake. In: Interstate Body of Water, Research Monograph #5, Utah State University, Logan.

Berry, James and Thomas Thompson. 1972. Conference of the Management of Recreational Lakes. Water Resources Center, University of Wisconsin, Madison.

Born, S. M., et. al. 1973. Restoring the Recreation Potential of Small Impoundments: The Marion Millpond Experience. Inland Lake Demonstration Project, Upper Great Lakes Regional Commission, Madison.

Boyter, C. J. and M. P. Wanielista. 1973. Review of Lake Restoration Procedures. Water Resources Bulletin, Vol. 9, No. 3, pp. 499-511, Urbana.

Bromley, Daniel W., et. al. 1970. Procedures for Evaluation of Water and Related Land Resource Projects: An Analysis of the Water Resources Council's Task Force Report. Center for Resource Policy Studies and Programs, University of Wisconsin, Madison.

Bromley, Daniel W., A. Allan Schmid, and William B. Lord. 1971. Public Water Resource Project Planning and Evaluation: Impacts, Incidence, and Institutions. Working Paper #1, Center for Resource Policy Studies and Programs, University of Wisconsin, Madison.

Bultena, Gordon. 1975. Community Values and Collective Action in Reservoir Development. Iowa State University, Ames, Iowa.

Burch, William R., Jr. 1964. Observation as a Technique for Recreation Research. Pacific Northwest Forest and Range Experiment Station, Forest Service, USDA, Portland, Oregon.

Burgess, J. E. 1966. Some Effects of Cultural Practices on Aquatic Environment and Native Fish Populations. In: Proceeding from the Annual Conference of the Southeastern Associated Game Commission, Vol. 19, pp. 225-235.

Catalano, Ralph, Stephen J. Simmons, and Daniel Stokols. 1975. Adding Social Science Knowledge to Environmental Decision Making. In: Natural Resources Lawyer, Vol. III (no. 1):41-59.

Clawson, Marion. 1959. Methods of Measuring the Demand for and Value of Outdoor Recreation. Resources for the Future, Inc., Reprint #10, Washington, D.C.

Cheek, Neil H., Jr., and Rabel J. Burdge. 1974. Outdoor Recreation and Planning: A Sociological Overview. North Central Research Strategy Committee on Natural Resource Development, Department of Sociology, Iowa State University, Ames.

Cicchetti, Charles, J. J. Seneca and P. Davidson. 1969. The Demand and Supply of Outdoor Recreation. Bureau of Economic Research, Rutgers-The State University, New Brunswick, N. J.

Cooper, Rollin, et. al. 1974. Upper Great Lakes Regional Recreation Planning Study, University of Wisconsin-Extension, Madison, Wisconsin.

Cornell University. 1974. State-of-the-Art on Methodology for Studying Environmental Perceptions, Beliefs, Values, and Attitudes and State-of-the-Art on Utilizing Perception, Attitude and Opinion Research. Rockefeller Foundation and Department of Rural Sociology, Cornell University, Ithaca, New York.

d'Arge, Ralph and Dean Peterson. 1974. Goals and Water Resource Planning. Chapter 3 in Peterson, et al., Water Resources Planning, Social Goals, and Indicators: Methodological Development and Empirical Tests. Utah Water Research Laboratory Publication PRWG-131-1, Logan, Utah, pp. 41-68.

Dasgupta, Satadal. 1975. Man, Community and Water: A Study of Local Attitudes Toward Dunk River Development. Dept. of Sociology and Anthropology, University of Prince Edward Island, Charlottetown, P.E.I., Canada.

David, Elizabeth and William Lord. 1969. Determinants of Property Value on Artificial Lakes. Department of Agricultural Economics, College of Agriculture and Life Sciences, University of Wisconsin, Madison.

Davis, Richard, et. al. 1972. Urban Public Policy and Political Institutions for Water-Quality Management on Lake Erie: Year One. U.S. Department of Interior, Office of Water Resources Research, Battelle Columbus Laboratories, Columbus, Ohio.

Dornbusch, David. 1975. The Impact of Water Quality Improvements on Residential Property Prices. Prepared for the National Commission on Water Quality, Washington, D.C.

Edmondson, W. T. 1969. Eutrophication in North America. In: Eutrophication: Causes, Consequences, and Correctives. National Academy of Sciences, Washington, D. C.

Field, Donald R. and Joseph T. O'Leary. 1972. Social Groups as a Basis for Assessing Participation in Selected Water Activities. Paper presented at the Rural Sociological Society Meetings, Baton Rouge, Louisiana.

Fox, A. C. 1968. Lake Eutrophication Problems and Progress. Minutes of the 152nd Meeting, Missouri Inter-Agency Committee, pp. 51-60, Bismarck.

Fox, Irving K. 1965. New Horizons in Water Resources Administration. Public Administration Review, Vol. 25 (1):61-69.

Fredricksen, R. L. 1970. Erosion and Sedimentation Following Road Construction and Timber Harvest on Unstable Soils in Three Small Western Oregon Watersheds. U.S. Forest Service Research Paper, No. 104, pp. 1-15.

Fulton, Jerome K. 1971A. Development and Evaluation of Citizen Participation Techniques for Inland Lake and Shoreline Management. U.S. Department of Interior, Office of Water Resources Research, Huron Watershed Council, Ann Arbor.

Fulton, Jerome K., et. al. 1971B. Inland Lakes: Analysis and Action, Cooperative Extension Service, Michigan State University, Extension Bulletin E-718, Natural Resources Series, East Lansing.

Golterman, H. L. 1975. Physiological Limnology: An Approach to the Physiology of Lake Systems. (mimeo).

Gum, Russell. 1974. Identification, Weights, and Measurements of Social Goals. Chapter 5 in Peterson, et. al., Water Resources Planning, Social Goals, and Indicators: Methodological Development and Empirical Tests. Utah Water Research Laboratory Publication PRWG-131-1, Logan, Utah, pp. 75-90.

Gum, Russell and W. E. Martin. 1975. Problems and Solutions in Estimating the Demand for and Value of Rural Outdoor Recreation. American Journal of Agricultural Economics, Vol. 57:558-566.

Heberlein, Thomas. 1971A. Moral Norms, Threatened Sanctions, and Littering Behavior. Unpublished Ph.D. Dissertation, Department Sociology, University of Wisconsin, Madison.

Heberlein, Thomas. 1971B. Perception of Alternatives and Attribution of Responsibility for a Water Pollution Problem. Paper presented at Rural Sociological Society Meetings, Baton Rouge, Louisiana.

Heberlein, Thomas. 1975. Social Norms and Environmental Quality. Paper presented at American Association for the Advancement of Science Meetings, New York City, New York.

Hendee, John C. and Rabel J. Burdge. 1974. The Substitutability Concept: Implications for Recreation Research and Management. Journal of Leisure Research, Vol. 6(2):157-162.

Judge, R. M. 1975. Cognitive Strawman: Public Input to a Water Resource Planning System. Dept. Hydrol. and Water Res., University of Arizona, Tucson.

Katelle, M. J. and P. D. Uttormark. 1971. Problem Lakes in the United States. University of Wisconsin Water Research Center, Hydrologic and Sanitary Laboratory, Madison.

Klessig, Lowell L. and Douglas Yanggen. 1970. Wisconsin Lake Property Owners Association: Identification, Description, and Perception of Lake Problems. University of Wisconsin, Madison.

Klessig, Lowell L. 1973. Recreational Property Owners and their Institutional Alternative for Resource Protection: The Case of Wisconsin Lakes. Inland Lakes Demonstration Project, University of Wisconsin, Madison.

Kooyoomjian, K. Jack and Nicholas L. Clesceri. 1974. Perception of Water Quality for Select Respondent Groupings in Inland Water-Based Recreational Environments. Water Resources Bulletin, Vol. 10(4):728-744.

Larsen, Douglas W. 1970. Cultural Impact Upon Lake Evolution. In: Man and Aquatic Communities, Water Resources Research Institute, Corvallis.

Myles, George A. 1966. Water Based Recreation in Nevada. Desert Research Institute #3, Progress Report Series Center for Water Resources Research, Reno.

Nicolson, J. A. and A. C. Mace, Jr. 1975. Water Quality Perception by Users. Can It Supplement Objective Water Quality Measure? In: Great Lakes Forestry Research Center, Sault Sainte Marie, Water Res. Bull., Vol. II, #6:1197-1207.

Patton, Michael, et. al. 1975. In Search of Impact: An Analysis of the Utilization of Federal Health Evaluation Research. Minnesota Center for Social Research University of Minnesota, Minneapolis.

Peterson, Dean, et. al. 1974. Water Resources Planning, Social Goals, and Indicators: Methodological Developmental and Empirical Tests. Utah Water Research Laboratory Publication PRWG-131-1, Logan, Utah.

Peterson, John H. 1971. Community Organization and Rural Water System Development. Water Resources Research Institute, Mississippi State University, State College.

Peterson, John H. and Peggy Ross. 1971. Changing Attitudes Toward Watershed Development. Water Resources Research Institute, Mississippi State University, State College.

Porter, Keith S. (ed). 1975. Sociological Investigations of Three Watersheds. In: Nitrogen and Phosphorus: Food Production, Waste, and the Environment, Ann Arbor Science Publishers, Michigan, pp. 273-303.

Powers, Charles. 1970. Eutrophication of Lakes. In: Man and Aquatic Communities. Water Resources Research Institute, Oregon State University, Corvallis.

Schneider, Robert. 1975. Diffuse Agricultural Pollution: The Economic Analysis of Alternative Controls. Ph.D. Dissertation, University of Wisconsin, Madison.

Sinna, Evelyn. 1971. Lake and River Pollution: An Annotated Bibliography. (mimeo)

Spaulding, Irving A. Undated. Social Status Variations in Attitudes and Conceptualization Pertaining to Water Pollution and Supply. Rhode Island Water Resources Center, University of Rhode Island, Kingston.

Stankey, George. 1972. The Use of Content Analysis in Resource Decision Making. Journal of Forestry, Vol. 70, 3, pp. 148-151.

State of Wisconsin. 1974. Survey of Lake Rehabilitation Techniques and Experiences. A Cooperative Effort of the University of Wisconsin and the Department of Natural Resources, Sponsored by the Upper Great Lakes Regional Commission prepared by Russell Dunst, et. al., Technical Bulletin No. 75, Madison.

Stevens, T. H. 1972. Equity and Water Resources Development. N. Y. State College of Agriculture and Life Science. Dept. Agricultural Economics, Cornell U., Water Resource and Marine Science Center, Tech. Bull. 39, Ithaca.

Sublette, W. J. and W. E. Martin. 1975. Outdoor Recreation in the Salt-Verde Basin of Central Arizona, Demand and Value. University of Arizona, Agricultural Experiment Station, Tech. Bull., Tucson.

Thompson, Peter. 1969. Brandywine Basin: Defeat of an Almost Perfect Plan. Science, Vol. 163;1180-1182.

U.S. Government. 1962. Merlin Division. Rogue River Basin, Project. U. S. Department of the Interior, Bureau of Reclamation, Boise.

U.S. Government. 1966. Bibliography on Socio-Economic Aspects of Water Resources. U.S. Department of the Interior, Office of Water Resources Research, Compiled by H. R. Hamilton, et. al., Battelle Memorial Institute, Columbus.

U.S. Government. 1973. Measures for the Restoration and Enhancement of Quality of Freshwater Lakes. U.S. Environmental Protection Agency, Office of Air and Water Programs, Division of Water Quality and Non-point Source Control and the Office of Research and Development, National Eutrophication Research Program, U.S. Government Printing Office, Washington, D.C.

U.S. Water Resources Council. 1973. Principles and Standards for Planning Water and Related Land Resources. Federal Register, Vol. 38, pp. 778-867.

Uttormark, Paul and J. P. Wall. 1975. Lake Classification--A Trophic Characterization of Wisconsin Lakes. EPA-660/3-75-033, U.S. Environmental Protection Agency.

Vlachos, Evan, et.al. 1975. Social Impact Assessment: An Overview. U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Virginia.

West, Patrick C. and L. C. Merriam, Jr. 1970. Outdoor Recreation and Family Cohesiveness: A Research Approach. Journal of Leisure Research, Vol. 2, #4, pp. 251-259.

Wilkening, Eugene, et. al. 1973. Quality of Life in Kickapoo Valley Communities. Report II, Institute for Environmental Studies, University of Wisconsin, Madison.

Wolf, C. P. (ed). 1975. Social Impact Assessment. Special issue of Environment and Behavior, Vol. 7, No. 3, pp. 259-404.